DOCUMENT RESUME

ED 234 124 UD 023 059

TITLE	E.H.A., Part B Flow-Through Entitlement's Project Speak. O.E.E. Evaluation Report, 1981-82.
INSTITUTION	New York City Board of Education, Brooklyn, N.Y. Office of Educational Evaluation.
PUB DATE	Jun 83
NOTE	32p.
PUB TYPE	Reports - Evaluative/Feasibility (142)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	*Achievement Gains; *Disabilities; Expressive Language; *Language Acquisition; Listening Comprehension; *Parent Child Relationship; *Parent Education; *Parent Role; Preschool Education; Program Effectiveness
IDENTIFIERS	New York City Board of Education; *Project Speak

ABSTRACT

This report presents an evaluation of the third and final year of Project Speak, funded under Part B of the Education for All Handicapped Children Act. Project Speak was initiated to stimulate the language development of preschool handicapped children through direct instruction and parent training. The program provided home-based language intervention, with training consisting of twice-weekly, 50-minute home visits designed to foster language development, demonstrate appropriate and constructive adult-child intervention, and assist parents in reinforcing the language acquisition skills of their severely to profoundly handicapped children. Parents were also trained in developmentally appropriate language activities. Analyses of data from formal and project-developed measures indicate that program objectives were met or surpassed. Participating children improved significantly in both auditory language comprehension and expressive language ability. In addition, parents and guardians of participating children gradually increased their use of the environment and of their own language development. It is thus recommended that the program's instructional techiques be replicated in other programs for preschool handicapped children and that they be tested and, if successful, implemented with older handicapped children. (GC)

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ED234124

O.E.E. EVALUATION REPORT
June 1983

E.H.A., PART B FLOW-THROUGH
ENTITLEMENT'S
PROJECT SPEAK
1981-82

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TABLE OF CONTENTS

		Page
I.	INTRODUCTION	1
II.	OBJECTIVES	3
III.	ACTIVITIES ACCOMPLISHED	4
IV.	EVALUATION FINDINGS	6
V.	CONCLUSIONS AND RECOMMENDATIONS	24

LIST OF TABLES

Title	Page
Table 1 Comparisons of Mean Pre- and Posttest Receptive and Expressive Language Scores for Linguistic Students, 1981-82	8
Table 2 Comparisons of Mean Pre- and Posttest Use-of-the Environment Scores for Parents of all 1981-82 students	10
Table 3 Comparisons of Mean Pre- and Posttest Language-Stimulation Scores for Parents of all 1981-82 Students	12
Table 4 Mean Child Language Scores for Linguistic Subjects at Three Assessment Points with Results of Repeated-Measures ANOVA and Post-Hoc Comparisons	14
Table 5 Mean Use-of-the-Environment Scores of Parents of Program Students at Three Assessment Points, with Results of Repeated Measures ANOVA and Post-Hoc Comparisons	16
Table 6 Mean Language-Stimulation Scores of Parents of Program Students at Three Assessment Points, with Results of Repeated-Measures ANOVA and Post-Hoc Comparisons	17
Table 7 Partial-Correlation-Coefficient Matrix of Child Language-Proficiency and Parent Language-Stimulation Scores for 1980-81 Posttest Data (Spring 1981)	19
Table 8 Partial-Correlation-Coefficient Matrix of Child Language-Proficiency and Parent Language-Stimulation Scores 1981-82 Posttest Data (Winter 1982)	20
Table 9 Partial-Correlation-Coefficient Matrix of Children's 1982 Posttest Language-Proficiency Scores and 1981 Posttest Parent Language Stimulation Scores	23

A SUMMARY OF THE EVALUATION
FOR THE
1981-82 PROJECT SPEAK

This report presents an evaluation of the third and final cycle of Project Speak, funded under Part B of the Education for all Handicapped Children Act (P.L. 94-142). The previous cycles were supported by state set-aside funds; the 1981-82 cycle was a component of the flow-through entitlement program, Supplementary Services for Handicapped Students.

Project Speak was initiated in 1979-80 to stimulate language development of pre-school handicapped students through direct instruction and parent training. During the 1981-82 school year the program continued to provide home-based language intervention for 42 severely and profoundly handicapped pre-school children who participated in the 1980-81 cycle; 30 were second-year and 12 were third-year students. The current cycle provided service for one semester (September, 1981 through February, 1982). Since the program was being phased out, no new participants were served. All of these children showed evidence of existing or anticipated severe speech impairment, although this was the sole handicapping condition for only four.

The program provided training through twice-weekly, 50-minute home visits designed to directly stimulate the language development of participating children, demonstrate appropriate and constructive adult-child interaction, and assist parents in reinforcing the language-acquisition skills of their children. Parents were also trained in developmentally appropriate language activities with emphasis placed on observing and naming, categorizing and classifying, and spatial and temporal concept formation.

Analyses of data from formal and project-developed measures over the past three program years indicate that program objectives were met at or beyond expected levels. This was true despite changes in personnel between cycles and variance in children's age and disabilities. Children who participated in Project Speak improved significantly each year in auditory-language comprehension and expressive-language ability. In addition, continued gains were observed for students participating in the program through a second and in some cases third year.

Parents and guardians of participating children generally increased their use of the environment and their own language to stimulate the language development of their handicapped children. Overall, however, the gains shown by parents of continuing participants were not as great as those shown by parents of first year students, suggesting that there may have been a limit to what parents could learn from this program beyond the first year.

The observation of significant correlations between parent and child scores supports the tenability of the program's treatment plan. It is strongly

recommended tht the highly effective instructional techniques used in this program be replicated in programs for pre-school handicapped. Further, these techniques ought to be piloted on older handicapped populations and, if successful, extended to special education programs serving these children.

I. INTRODUCTION

This report presents an evaluation of the third and final cycle of Project Speak, funded under Part B of the Education for all Handicapped Children Act (P.L. 94-142). The previous cycles were supported by state set-aside funds; the 1981-82 cycle was a component of the flow-through entitlement program, Supplementary Services for Handicapped Students.

The need for early-childhood intervention programs for handicapped children in New York City has been clearly shown by more than 500 inquiries received each year by Early Childhood Direction Centers, the Board of Education, and the Find-Me outreach program.

The effectiveness of such programs for ameliorating some of the deficiencies of pre-school handicapped children was reviewed in a 1979 report to Congress by the Comptroller General which found that such programs can have substantial positive effects on the health and educational success of handicapped children; fewer placements in special education programs were among the benefits observed. Gallagher's (1975) review of research on child development, as it applies to special education, supports these same conclusions.

Project Speak was initiated in 1979-1980 to stimulate language development of pre-school handicapped students through direct instruction and parent training. Evaluation of the 1979-80 and 1980-81 programs by the Office of Educational Evaluation concluded that the objectives were met for both child language growth and parent language stimulation. Specifically, the program promoted statistically significant growth

for the total student sample in five measures of linguistic competence; however the first-year students demonstrated greater gains than second-year students. Similarly, parents and guardians of participating children generally increased their use of the environment and their own language to stimulate the language development of their handicapped children. However, few significant gains were made by parents of continuing participants, suggesting that there may have been a limit to what parents could learn from this program beyond the first year.

The following chapters of this report present program objectives, activities accomplished, evaluation findings, and conclusions and recommendations.

II. OBJECTIVES

The program was designed to accomplish four objectives, two pupil-centered and two parent-centered. The objectives state that by February 15, 1982:

--participating children will score significantly higher in auditory language comprehension, as measured by Carrow Test for Auditory Comprehension of Language;

--participating children will score significantly higher in expressive language ability, as measured by scores obtained from a language sample;

--parent participants will use the environment to a significantly greater extent for stimulating the language development of their children, as measured by a program-developed questionnaire; and

--parent participants will score significantly higher in language stimulation, as measured by a project-developed scale.

The criterion for all significance tests was $p<.05$.

III. ACTIVITIES ACCOMPLISHED

During the 1981-1982 school year, Project Speak continued to provide home-based language intervention for 42 severely and profoundly handicapped pre-school children who participated in the 1980-81 cycle; 30 were second-year and 12 were third-year students. The current cycle provided service for one semester (September, 1981 through February, 1982). Since the program was being phased out, no new participants were served. All of these children showed evidence of exisiting or anticipated severe speech impairment, although this was the sole handicapping condition for only four. The most frequent concomitant handicap was mental retardation (23 students); others were physical handicap, emotional handicap, visual impairment, or multiple handicap. The median age of the children was approximately 49 months ranging from 12 to 69 months.

Project Speak received referrals from the Committees on the Handicapped, hospitals, nursery and day schools, Project Find-Me, private physicians, and parents. Each referral was assessed to determine baseline levels of congitive-linguistic functioning and formulate individualized speech and therapy goals.

The program provided training through twice-weekly, 50-minute home visits designed to directly stimulate the language development of participating children, demonstrate appropriate and constructive adult-child interaction, and assist parents in reinforcing the language-acquisition skills of their children. Parents were also trained in developmentally appropriate language activities with emphasis placed on observing and naming, categorizing and classifying, and spatial and temporal concept

formation.

In addition, the parents were trained to stimulate language within the framework of 16 common domestic routines through the following techniques: maintain direct visual contact with the children; repeat infant babble; talk about specific ongoing activities; use short, precise sentences; encourage identification of objects; pair objects with their locations; and refer to past and future time.

Parents were also encouraged to attend two meetings of the Parents Advisory Council which served as a link between the home, the therapists, the Speech Services Unit of the Division of Special Education, and the program administration. The Council served as a vehicle for parent involvement in decisions regarding program operations, including the formulation of policy, program implementation, and evaluation.

IV. EVALUATION FINDINGS

PUPIL ACHIEVEMENT

Pupil and parent assessment data for the 1980-81 and 1981-82 program cycles were gathered and analyzed to determine whether the 1981-82 program objectives were attained, and to assess the contribution of the program treatment to the observed gains. The former was accomplished through comparisons of student and parent assessments administered prior to and following 1981-82 treatment; the latter involved comparison of these gains (i.e., between fall 1981 and winter 1982) with those observed during the summer hiatus (i.e., between spring 1981 and fall 1981).

EVALUATION OF PROGRAM OBJECTIVES (1981-82)

Student Objectives

To measure student gains in auditory comprehension (Objective 1), the students were tested on the Carrow Test for Auditory Comprehension of Language. The Carrow, which consists of 101 reproductions of line drawings, takes approximately 20 minutes to administer and is used with children from ages three years, 11 months to six years, 11 months. It assesses oral-language comprehension without requiring language expression from the child. For each item, the test indicates the chronolgical age at which 75 percent and 90 percent of the normative group responded correctly.

Expressive-language ability (Objective 2) was measured through audio-tapes of the children's speech. Each tape (speech sample) was scored by a linguistics expert for number of T units (complete thoughts including a main clause and its subordinate clauses), average T-unit length, and the

number of nouns and verbs.

Since funding issues delayed 1981-82 program start-up, students were pre-tested between October and December as they enrolled for treatment. They were post-tested from January to February, 1982. Thus the treatment period varied from six to 34 sessions with a mean of 22 fifty-minute sessions over 14 weeks.

Although the program served both linguistic and prelinguistic students, to facilitate the valid evaluation of pupil growth in response to program intervention, data were analyzed only for those students who were linguistic by the date of posttesing. Linguistic status was defined as the demonstration of at least one instance of speech on taped expressive-language samples. Of the 42 students served, 34 met the linguistic criterion and were included in the evaluation sample for Objective 1; pre- and post-test language samples were available for 33 of these 34 students and they comprised the sample for Objective 2.

To determine whether the linguistic students showed statistically significant gains in receptive and expressive language ability, t tests for correlated means were applied to the mean differences in pre- and posttest scores on the Carrow and the four scores based on the language samples. (See Table 1.) The gains for all measures were statistically significant. The 34 linguistic students showed a mean raw-score gain on the Carrow of 7.5 (t = 4.5, df = 33, $p < .01$), from M = 19.7 (S.D. = 25.8) to M = 27.2 (S.D. = 29.1). Based on the 75-percent-criterion this increase is equivalent to a six-month gain in developmental age from five years to five years and six months. That is, for the norm group, the age at which 75 percent obtained the pretest mean raw score was five and the age at which they obtained the posttest raw score was five years,

TABLE 1

Comparisons of Mean Pre- and Posttest Receptive and Expressive Language Scores for Linguistic Students, 1981-82

Measures	Test Session	Mean	S.D.	$\bar{D}$[b]	S.E.[c]	t	N
Carrow	Pre	19.7	25.8	7.5	1.7	4.5**	34
	Post	27.2	29.1				
T units, Number	Pre	7.9	17.0	4.6	2.2	2.1*	33
	Post	12.5	17.2				
T units, Length	Pre	1.2	1.7	1.0	0.2	4.2**	33
	Post	2.2	1.7				
Nouns, Number	Pre	27.5	21.0	22.6	5.2	4.3**	33
	Post	50.1	39.3				
Verbs Number	Pre	11.1	18.5	10.0	3.1	3.1**	33
	Post	21.1	26.6				

*$p < .05$ **$p < .01$

[a]Receptive language ability was measured by the Carrow Test for Auditory Comprehension of Language; expressive language was measured through audio-taped language samples.

[b]Mean pre- to posttest difference

[c]Standard error of the mean difference

.The linquistic students showed statistically significant pre- to posttest gains at the .01 level on the Carrow and three expressive-language scores (length of T units, number of nouns, and number of verbs); the mean gain in the number of T units was significant at the .05 level.

six months.

For the expressive-language samples, the linguistic students showed mean increases of 4.5 (t = 2.1, df = 32, $p < .05$) in total number of T units and 1.0 (t = 4.2, df = 32, $p < .01$) in the length of T units; the mean increase in number of nouns was 22.5 (t = 4.3, df = 32, $p < .01$) and the mean increase in number of verbs was 10.0 (t = 31, df = 32, $p < .01$). Thus, the data indicate that both Objectives 1 and 2 were attained.

Two instruments were used to determine whether parent-centered program objectives were met. First, parents completed pre- and post-questionnaires on their use of language-stimulation techniques to 16 day-to-day situations (Objective 3). The questionnaire sampled five techniques: encouraging identification of objects; talking about specific ongoing activities; pairing objects with locations; referring to past time; and referring to future time. Second a linguistics expert used a program-developed scale to rate audio-tapes of parent-child interactions. Language samples were scores on four dimensions: number of wh and other questions, expansions, and models (Objective 4). The parent and student tests mentioned above were administered concurrently.

Parent Objectives

To determine whether the parents of program students showed statistically significant increases in self-reported language-stimulation activities, t tests for correlated means were applied to the mean pre- to posttest differences for the five parent-questionnaire scores. (See Table 2.) Since the parents of all program students (both linguistic and prelinguistic) received language-stimulation training, data were analyzed for the total parent sample (N = 42). As shown in Table 2, the parents demonstrated statistically significant gains in

TABLE 2

Comparisons of Mean Pre- and Posttest Use-of-the Environment Scores for Parents[a] of all 1981-82 Students (N = 42)

Technique	Assessment	Mean	S.D.	$\overline{D}$[b]	S.E.[c]	t
Naming Objects	Pre	13.2	2.6	1.2	0.3	3.9**
	Post	14.4	2.2			
Naming Actions	Pre	12.7	3.4	1.6	0.4	4.5**
	Post	14.3	2.2			
Pairing Objects and Locations	Pre	10.5	5.0	1.8	0.7	2.8**
	Post	12.3	4.7			
Past Reference	Pre	9.6	5.7	0.9	0.5	2.1*
	Post	10.5	5.5			
Future Reference	Pre	10.5	5.5	0.7	0.7	0.9 N.S.
	Post	11.2	5.1			

*$p < .05$; **$p < .01$; N.S. = Not significant

[a]Use of the environment for language stimulation was measured through a program-developed questionnaire administered to parents of all program students.

[b]Mean pre- to posttest difference.

[c]Standard error of the mean difference

.The parents of program students showed statistically significant increases, at the .01 level, in three of the five use-of-the environment measures and at the .05 level for one other.

four of the five use-of-the-environment scores. The magnitudes of significant gains were 1.6 for naming actors (t = 4.5, df = 41, $p < .01$); 1.2 for naming objects (t = 3.9, df = 41, $p < .01$); and 0.9 for past reference (t = 2.1, df = 41, $p < .05$). The gain for future reference were not significant. Thus, since significant increases were observed for four of the five parent use-of-the-environment scores, Objective 3 was attained.

To determine whether the parents demonstrated a significant increase in language-stimulation activities, t tests for correlated means were applied to the mean pre- to posttest differences on the four scores of audio-taped interactions. (See Table 3.) The sample of 42 parents showed a statistically significant increase in one of the four scores: the mean gain for use of models was 17.4 (t = 4.7, df = 41, $p < .01$) from M = 40.5 on the pretest to M = 57.9 on the posttest. None of the other three gains were statistically significant. Thus, the objective was partially attained. In interpreting this finding, it should be noted that all of the parents in the above analysis were continuing participants in the program. As observed in last year's evaluation, the gains of continuing parents were less than those of first-year participants. The above findings may be attributable to this phenomenon.

EFFECT OF TREATMENT UPON PUPIL GAINS

To determine whether the significant pupil gains in receptive and expressive language ability could be attributed to program activities, the mean pupil scores obtained in spring 1981, fall 1981, and winter 1982 on the Carrow and the four language-sample ratings were compared through separate one-way analyses of variance (anovas) for repeated measures. The spring

TABLE 3

Comparisons of Mean Pre- and Posttest Language-Stimulation Scores for Parents of all 1981-82 Students (N = 42)[a]

Technique	Assessment	Mean	S.D.	$\overline{D}$[b]	S.E.[c]	t
Wh questions	Pre	24.1	19.7	4.3	2.4	1.8 n.s.
	Post	28.4	18.1			
Other questions	Pre	18.4	12.5	2.4	1.7	1.5 n.s.
	Post	20.8	12.3			
Expansions	Pre	16.6	15.8	2.0	1.3	1.6 n.s.
	Post	18.6	14.6			
Models	Pre	40.5	18.8	17.4	3.7	4.7**
	Post	57.9	23.8			

**$p < .01$; N.S. = Not significant

[a]Parent language-stimulation scores were based on audio-taped language samples.

[b]Mean pre- to posttest difference.

[c]Standard error of the mean difference

.The parents showed a statistically significant increase in the use of one of the five language-stimulation techniques, models.

1981 scores, which were obtained in late May through early July, provided baseline ratings, the fall 1981 scores indicated pupil performance following the non-treatment summer break, and the winter 1982 scores indicated pupil performance following the fall treatment period. Complete data sets (i.e. scores for all three test sessions) were obtained for 28 linguistic children. Table 4 presents a summary of the anovas and post-hoc comparisons for the receptive and expressive language measures.

The anovas revealed significant overall gains ($p < .01$) for all language measures. Post-hoc comparisons were performed to determine which pairs of means differed significantly for each analysis. For all measures, the winter 1982 post-test means were significantly higher than both the fall 1981 pre-test means and the spring 1981 post-test means while the fall means were not significantly different from the spring means. These findings indicated that the children improved siginificantly in all language scores during the treatment period but not during the summer non-treatment period. Accordingly, the gains in language scores appear to be associated with program treatment.

EFFECT OF TREATMENT UPON PARENT LANGUAGE STIMULATION

To determine whether program training had a statistically significant effect upon parents' langauge-stimulation activities, the mean parent scores obtained in spring 1981, fall 1981, and winter 1982 on the language-stimulation questionnaires and language samples were compared through separate one-way anovas for repeated measures. The rationale for inferring program effects through these analyses is the same as for the analyses of student scores above.

Summaries of the anovas and post-hoc comparisons of all pairs of means are presented in Table 5 for the questionnaire data and Table 6 for the

TABLE 4

Mean Child Language Scores for Linguistic Subjects at Three Assessment Points with Results of Repeated-Measures ANOVA and Post-Hoc Comparisons[a] (N=28)

		ANOVA			Post-hoc Comparisons[d]	
Measures	Assessment	Mean score	(S.D.)[b]	F	Period[c]	Gain
Carrow	Spring '81	19.9	(25.8)		Nontreatment	2.8
	Fall '81	22.7	(26.9)	10.00**	Treatment	9.1**
	Winter '82	31.8	(29.6)		Total	11.9**
T-units, number	Spring '81	6.1	(10.9)		Nontreatment	0.3
	Fall '81	6.4	(11.5)	9.0**	Treatment	6.9**
	Winter '82	13.3	(17.3)		Total	7.2**
T-units, length	Spring '81	1.4	(1.7)		Nontreatment	0.1
	Fall '81	1.5	(1.8)	12.6**	Treatment	1.0
	Winter '82	2.5	(1.6)		Total	1.1
Nouns, number	Spring '81	27.4	(19.9)		Nontreatment	5.1
	Fall '81	32.5	(18.9)	20.2**	Treatment	25.8
	Winter '82	58.3	(36.9)		Total	30.9
Verbs, number	Spring '81	11.1	(18.9)		Nontreatment	2.0
	Fall '81	13.1	(19.5)	8.8**	Treatment	8.9**
	Winter '82	22.0	(25.4)		Total	10.9**

**$p<.01$

[a] Linguistic subjects were those with Carrow scores greater than zero as of spring 1981.

[b] Standard deviation

[c] The Nontreatment period is from spring '81 to fall '81; Treatment is from fall '81 to winter '82; and Total refers to the entire period from spring '81 to winter '82.

[d] Post-hoc comparisons performed only when overall F was significant.

. For all measures of child language, the gains made during the treatment period were statistically significant ($p<.01$) while gains made during the non-treatment summer break were not.

language samples. For the questionnaire, significant overall mean differences were observed for three of the five scores: naming objects (F = 4.3, df = 2 and 74, $p < .05$); naming actions (F = 8.2, df = 2 and 74, $p < .01$); and past reference (F = 3.7, df = 2 and 74, $p < .05$.) Post-hoc comparisons indicated that the mean parent gains for naming objects and naming actions increased significantly during the treatment period but not during the nontreatment period. Indeed, none of the five questionnaire scores showed significant increases during the summer break. Accordingly, this analysis suggests that at least some of the parent gains in questionnaire scores are attributable to program training.

The results for the language-sample scores were equivocal with respect to the effects of parent training. The F tests for number of wh questions, expansions, and models were significant. Post-hoc analyses revealed that the mean number of models increased significantly ($p < .01$) for the treatment period after a marked but not significant decline during the summer break. The parents showed a mean increase in the number of models of 15.5 between fall pre- and winter posttest after a mean decrease of 10.2 between spring 1981 and winter 1982. Although the F test for mean differences in number of wh questions was statistically significant, the significant gain was for the total period (spring 1981 to winter 1982) and not for either the treatment or nontreatment period. Accordingly, the significant gain was based on the cumulative effect of gains that occurred during both the treatment and nontreatment periods. The total mean gain for models was 7.8 ($p < .05$); the mean gains for the nontreatment and treatment periods were 4.9 and 2.9 respectively.

For models, the mean gains for the total period and the nontreatment

TABLE 5

Mean Use-of-the-Environment Scores of Parents of Program Students at Three Assessment Points, with Results of Repeated-Measures ANOVA and Post-Hoc Comparisons[a] (N = 38)

Techniques	Assessment	ANOVA Mean score	(S.D.)[b]	F	Post-Hoc Comparisons[d] Period[c]	Gain
Naming Objects	Spring '81	13.8	(1.8)	4.3*	Nontreatment	-0.2
	Fall '81	13.6	(2.0)		Treatment	0.9*
	Winter '82	14.5	(2.1)		Total	0.7
Naming Actions	Spring '81	13.1	(2.5)	8.2**	Nontreatment	-0.1
	Fall '81	13.0	(2.8)		Treatment	1.6**
	Winter '82	14.6	(1.7)		Total	1.5**
Pairing Objects and Locations	Spring '81	10.9	(4.8)	3.1 n.s.		
	Fall '81	11.0	(4.8)			
	Winter '82	12.7	(4.3)			
Past Reference	Spring '81	9.1	(5.9)	3.7*	Nontreatment	1.2
	Fall '81	10.3	(5.4)		Treatment	0.9
	Winter '81	11.2	(5.1)		Total	2.1*
Future Reference	Spring '81	9.4	(5.1)	3.1 n.s.		
	Fall '81	11.1	(5.3)			
	Winter '82	11.6	(4.8)			

*$p<.05$, **$p<.01$, n.s. = not significant

[a] Scores based on self-report questionnaire.
[b] Standard deviation.
[c] The Nontreatment period is from spring '81 to fall '81; Treatment is from fall '81 to winter '82; and Total refers to the entire period from spring '81 to winter '82.
[d] Post-hoc comparisons performed only when overall F was significant.

- Naming actions and naming objects showed a statistically significant ($p<.05$) increase during the treatment period.

- Naming actions and past reference increased significantly for the total period.

TABLE 6

Mean Language-Stimulation Scores of Parents of Program Students at Three Assessment Points, with Results of Repeated-Measures ANOVA and Post-Hoc Comparisons[a] (N =37)

		ANOVA			Post-hoc Comparisons[d]	
Techniques	Assessment	Mean score	(S.D.)[b]	F	Period[c]	Gain
	Spring '81	21.0	(15.2)		Nontreatment	4.9
Wh questions	Fall '81	25.9	(19.8)	4.8*	Treatment	2.9
	Winter '82	28.8	(18.4)		Total	7.8*
Other questions	Spring '81	17.7	(10.4)			
	Fall '81	18.6	(11.9)	1.0 n.s.		
	Winter '82	22.0	(11.5)			
	Spring '81	11.7	(12.4)		Nontreatment	6.5**
Expansions	Fall '81	18.2	(15.7)	15.9**	Treatment	3.8
	Winter '82	22.0	(14.4)		Total	10.3**
	Spring '81	49.8	(26.4)		Nontreatment	-10.2
Models	Fall '81	39.6	(18.9)	6.1**	Treatment	14.2**
	Winter '82	55.1	(22.9)		Total	5.3

*$p<.05$, **$p<.01$, n.s. = not significant

[a] Based on scores of taped language samples.
[b] Standard deviation.
[c] The Nontreatment period is from spring '81 and fall '81; Treatment is from fall '81 to winter '82; and Total refers to the entire period from spring '81 to winter '82.
[d] Post-hoc comparisons performed only when overall F was significant.

.The number of models increased significantly during the treatment period after a large but not significant decline during the summer break.

.Number of wh questions showed a significant gain for the total period from spring '81 to winter '82 but not for the treatment or nontreatment periods

.Number of expansions increased significantly for the total period and the nontreatment period but not for the treatment period

period were significant while the gain for the treatment period was not; the mean gains were 10.3 ($p < .01$), 6.5 ($p < .01$), and 3.8 respectively.

Thus, the findings for two measures of parents' language-stimulation showed a uneven pattern of continued treatment effects. While these second- and third-year parents showed a significant mean increase in naming actions, naming objects, and the number of models following treatment but not over the summer break, the reverse was true for expansions.

RELATIONSHIP BETWEEN PARENT AND CHILD SCORES

Since the program was designed to promote language development in handicapped pre-schoolers through parent language-stimulation training, the relationship between measures of these two sets of variables provides another test of the effectiveness of the program and the tenability of its rationale. Accordingly, correlation coefficients were computed between the parent language-stimulation measures and the students' auditory comprehension and expressive-language sample scores. Correlations were computed for both the spring 1981 and winter 1982 posttests; the former reflects the effects of the 1980-1981 cycle and the latter the 1981-82 cycle. Posttest data were used since they represented the levels of parent and student achievement following program treatment. Variance in pretest student performance and number of treatment sessions were controlled through partialing. Accordingly, the correlation coefficients are second-order partials. (See Technical Note 1.)

Tables 7 and 8 are matrices of obtained partial correlation coefficents for the 1980-81 and 1981-82 data, respectively. For both project cycles, statistically significant correlations were observed between the number of wh questions asked by parents and the number of nouns in their children's

TABLE 7

Partial-Correlation-Coefficient Matrix of Child Language-Proficiency and Parent Language-Stimulation Scores for 1980-81 Post-test Data[a] (Spring 1981)

Parent language-stimulation measures[c]	Student Measures[b]				
	Carrow (n = 66)	Number of T units (n = 31)	Length of T units (n = 31)	Number of nouns (n = 31)	Number of verbs (n = 31)
Number of wh questions	.03	.32*	.12	.43**	.33*
Number of other questions	.07	-.04	-.01	-.23	.06
Number of expansions	.15	.16	.22	.41**	.11
Number of models	.15	-.32*	.03	.00	-.33*

*p<.05; **p<.01

[a]Correlation coefficients are second-order partials controlling for pre-test student scores and number of treatment sessions.

[b]Student measures include the Carrow Test for Auditory Comprehension of Language and four expressive-language scores based on lanugage samples.

[c]Based on scoring of audio-tapes of parent-child verbal interactions.

.Number of wh questions by parents correlated significantly at the .01 level with the number of nouns in student language samples and at the .05 level with number of T units and verbs.

.Number of expansions by parents correlated significantly (p<.01) with number of nouns by students.

.Number of models showed a significant (p<.05) inverse correlation with number of T units and number of verbs. That is, the more models used by the parents the fewer verbs and T units in the children's language samples.

TABLE 8

Partial-Correlation-Coefficient Matrix of Child Language-Proficiency and Parent Language-Stimulation Scores for 1981-82 Post-test Data[a] (Winter 1982)

Parent language-stimulation measures[c]	Student Measures[b]				
	Carrow (n = 37)	Number of T units (n = 24)	Length of T units (n = 24)	Number of nouns (n = 24)	Number of Verbs (n = 24)
Number of wh questions	.38**	.22	.34*	.45**	.00
Number of other questions	.33*	.10	-.04	-.08	.22
Number of expansions	.33*	.18	.16	.09	.12
Number of models	-.02	.17	.13	.15	.19

*p<.05; **p<.01

[a]Correlation coefficients are second-order partials controlling for pre-test student scores and number of treatment sessions.

[b]Student measures include the Carrow Test for Auditory Comprehension of Language and four expressive-language scores based on language samples.

[c]Based on scoring of audio-tapes of parent-child verbal interactions.

Number of wh questions by parents correlated significantly at the .01 level with the children's Carrow Auditory Comprehension scores and the number of nouns in the language samples and at the .05 level with length of T units.

.Number of other questions and number of expansions correlated significantly (p<.05) with Carrow scores.

expressive language samples (for 1980-81, r = .43, n = 31, p < .01; for 1981-82, r = .45, n = 24, p < .01)*. Number of wh questions accounted for 18 percent and 20 percent of the variance in number of nouns for each year, respectively. For each program cycle, number of wh questions correlated significantly with two additional student measures, albeit different ones each year: the partial correlations with number of T units and number of verbs for 1980-81 were r = .32 (n = 31, p < .05), and r = .33 (n = 31, p < .05), respectively; for 1981-82 the partial correlations with the Carrow and length of T units were r = .38 (n = 37, p < .01) and r = .34 (n = 24, p < .05), respectively. Children's auditory comprehension also correlated significantly with number of other questions (r = .33, n = 37, p < .05) and number of expanisons (r = .33, n = 37, p < .05) in 1981-82, but showed no significant correlations with any of the four parent language-stimulation scores in 1980-81. However, number of expansions did correlate significantly with number of nouns in 1980-81 (r = .41, n = 31, p < .01). Number of models showed either no significant or significant inverse correlations (see Technical Note 2) with student language proficiency for both program cycles.

These findings suggest that, across both program cycles, number of wh questions by parents was consistently associated with the number of nouns in their children's language productions. Further, the observation of significant correlations between measures of parent language stimulation and children's language proficiency lends support to the effectiveness of the program and its fundamental rationale (i.e., that the language development of handicapped preschoolers may be facilitated through parent training in language-stimulation techniques).

To further explore the relationships between parent language stimulation and their children's language development and assess the carry-over effects of parent training between program cycles, partial correlations were computed between the 1980-81 parent posttests and the 1981-82 student posttests controlling for the effects of 1981-82 student pretests and treatment sessions. As reported in Table 9 three correlations were statistically significant: students' Carrow scores correlated significantly with parents' number of wh questions and number of expansions , $r = .37$ ($n = 34$, $p < .05$) and $r = .38$ ($n = 34$, $p < .05$), respectively; the correlation between students' number of T units and parents' number of other questions was also significant ($r = .39$, $n = 25$, $p < .05$).

Hence, these data lend some support to the carry-over effect of parent language-stimulation training upon children's language development, particularly auditory comprehension. Taken together with the previous analyses, these findings suggest that asking wh questions may be the most effective parent language-stimulation method, particularly for increasing children's auditory comprehension and the use of nouns.

TABLE 9

Partial-Correlation-Coefficient Matrix of Children's 1982 Post-test Language-Proficiency Scores and 1981 Post-test Parent Language Stimulation Scores[a]

Parent language[c] stimulation measures (Spring 81)	Student Measures[b] (Winter 82)				
	Carrow (n = 34)	Number of T units (n = 25)	Length of T units (n = 24)	Number of nouns (n = 24)	Number of Verbs (n = 24)
Number of wh questions	.37*	.14	-.03	.19	.16
Number of other questions	.23	.39*	.14	-.01	.23
Number of expansions	.38*	.18	-.04	.00	.22
Number of models	.03	.12	-.11	-.12	.02

*p<.05; **p<.01

[a]Correlation coefficients are second-order partials controlling for pre-test student scores and number of treatment sessions.

[b]Student measures include the Carrow Test for Auditory Comprehension of Language and four expressive-language scores based on language samples.

[c]Based on scoring of audio-tapes of parent-child verbal interactions.

Number of wh questions by parents in the 1981 post-test (Spring 1981) correlated significantly (p<.05) with children's 1982 Carrow post-test scores (winter 1982).

Number of other questions correlated significantly (p<.05) with the number of T units.

Number of expansions correlated significantly (p<.05) with the Carrow scores.

V. CONCLUSIONS AND RECOMMENDATIONS

Analyses of data from formal and project-developed measures over the past three program years indicate that program objectives were met at or beyond expected levels. This was true despite changes in personnel between cycles and variance in children's age and disabilities. Children who participated in Project Speak improved significantly each year in auditory language comprehension and expressive-language ability. In addition, continued gains were observed for students participating in the program through a second and in some cases third year.

Parents and guardians of participating children generally increased their use of the environment and their own language to stimulate the language development of their handicapped children. Overall however, the gains shown by parents of continuing participants were not great as those demonstrated by parents of first year students, suggesting that there may have been a limit to what parents could learn from this program beyond the first year.

Although there was no formal comparison group, two findings suggest a causal relationship between program treatment and child language development. First, the children showed significant improvement in both auditory language comprehension and expressive-language skills during the course of treatment but not during the summer break. Thus, students showed gains in response to treatment and no gains in the absence of treatment. Second, consistent with the program's fundamental rationale, relationships were observed between parent language stimulation and children's language proficiency. For two

program cycles, the number of wh questions by parents correlated significantly with the number of nouns in their children's language productions. Moreover, there was some evidence of carry-over effects of parent training upon language development. That is, the level of parent preformance in language stimulation at the end of the 1980-81 program cycle was associated with their children's language proficiency in the winter of 1982. Accordingly, the effectiveness of the program's treatment plan seems tenable.

In conclusion, by all measures and standards, Project Speak accomplished what it set out to do in terms of stimulating language development in handicapped preschoolers by developing their parents' insights and language stimulation skills. It is strongly recommended that the highly effective instructional techniques used in this program be replicated in other programs for the pre-school handicapped. Further, these techniques ought to be piloted on older handicapped populations and, if successful, extended to special education programs serving these children.

TECHNICAL NOTES

1. Partial correlation coefficients show the correlation between two variables while holding the value(s) of some other variable(s) at a constant level. Often at least part of the correlation between two variables is due to another variable strongly related to each. Partial correlations show the relationship between two variables free of their correlation with these other specified variables(s). Second-order partials control for two variables simultaneously.

2. An inverse correlation between two variables signifies that higher values on one tend to be associated with lower values on the other. For example, in the audio-tapes of parent-child verbal interactions, more models demonstrated by parents was associated with fewer verbs in the speech of their children.